Patient Surveillance Algorithms for the Emergency Department

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Emergency Dept Infomatics

Emergency Medicine

Machine Learning
Motivation

Electronic Medical Record (EMR):
• Contains lots of medical information about a patient
• Updated in real time
• But no one can be watching these records all the time.

Can we build a model of a patient based on the information in the EMR so that a monitoring algorithm can pose clinical questions and possibly raise alerts if necessary.

Example Application: Sepsis
• The body’s severe reaction to infection
• Early goal directed therapy helps
  – But has to be recognized early AND acted upon early

For example: Is this patient at risk for developing sepsis?
The EMR as a Generative Process

Patient X

Free text

Numerical

Time series data

Question:
How do we model what’s going on in here?

Previous work used just the triage notes represented by topic distributions to predict whether a patient is at risk for sepsis, with encouraging success.
Possible Patient Representation

The topics discovered by topic modeling in the triage note can be a useful latent space to understand the lab values.

Topics as Patient Types

<table>
<thead>
<tr>
<th>Most likely words</th>
<th>Example highly ranked note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain knee left fall wrist shoulder ankle injury hand</td>
<td>Left leg pain 30 yr old woman from home after a trip and fall down 5 steps… pain in left leg from knee to ankle …</td>
</tr>
<tr>
<td>Chest pain cp sob c/o sided left arm nausea radiating</td>
<td>Chest pain- pt with chest pressure x 24 hours radiating down left arm…</td>
</tr>
</tbody>
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